

JAPANESE PATENT OFFICE  
PATENT JOURNAL (U)  
KOKAI UTILITY MODEL NO. HEI 2[1990]-4287

Int. Cl. <sup>5</sup> :	H 05K 5/02 H 02G 15/14 H 04B 3/36 H 05K 7/20
Sequence Nos. for Office Use:	6835-5E 7004-5G 7323-5K 7373-5E
Filing No.:	Sho 63[1988]-83107
Filing Date:	June 22, 1988
Publication Date:	January 11, 1990
No. of Claims:	1
Examination Request:	Not filed

HEAT DISSIPATING AND BUFFERING STRUCTURE FOR UNDERSEA REPEATER

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[There are no amendments to this patent.]

### Claim

Heat dissipating and buffering structure for an undersea repeater characterized in that it is furnished with: an internal unit for housing the undersea repeater, an external casing to protect the internal unit from the external water pressure, a thin metal cylinder that fits around the outer circumference of the aforementioned internal unit, and multiple metal springs in the cylindrical space formed between the aforementioned external casing and the aforementioned metal cylinder that elastically support the aforementioned internal unit against the inside wall of the aforementioned external casing; the sectional shape of each of the aforementioned metal springs is such that the open end forms an arc part that curves inside, and the curvature between the arc part and the fixed end forms a bow-shaped part that is larger than the aforementioned arc part, and the aforementioned multiple metal springs are arranged at equal intervals affixed to the outside surface of the aforementioned metal cylinder.

### Detailed explanation of the design

#### Industrial application field

This design pertains to a heat dissipating and buffering structure for an undersea repeater. It pertains in particular to a heat dissipating and buffering structure for the undersea repeater that supports the external casing that protects the internal unit from water pressure so that it can dissipate heat and can buffer.

#### Prior art

In the past, heat dissipating and buffering structures for undersea repeaters were furnished with metal springs in the cylindrical space formed between the internal unit that houses the undersea repeater and the external casing so that the internal unit is elastically supported in the external casing.

Figures 4 (a) and (b) are cross sections showing first and second examples of conventional structures. As shown in Figure 4 (a), metal spring (8) in the first example is a wavy sheet formed into a cylindrical shape to match the gap between external casing (2) and internal unit (1). Metal spring (9) in the second example is composed of multiple arc-shaped plates as shown in Figure 4 (b), and they are affixed at equal intervals around the outside circumference of metal cylinder (3).

#### Problems to be solved by the design

To realize heat dissipation and buffering by the internal unit, the metal spring must be pressed against both the internal unit and the external casing with suitable force.

However, in the above-mentioned first conventional example, metal spring (8) has the disadvantage that elasticity in the radial orientation is low for a spring. So, when internal unit (1) is inserted into external casing (2) along with metal spring (8), excessive resistance is created and insertion is difficult. Conversely, places where metal spring (8) does not touch external casing (2) occur easily and heat dissipation will be insufficient. With the second conventional example, if the rigidity of metal spring (9) is reduced to improve the insertion and buffering effects for external casing (2), there is the disadvantage that movement by internal unit (1) will not be completely absorbed when a large impact occurs, and internal unit (1) will directly impact external casing (2).

#### Means to solve the problems

The heat dissipating and buffering structure for the undersea repeater of this design is furnished with: an internal unit that houses the undersea repeater, an external casing that protects the internal unit from the external water pressure, a thin metal cylinder that fits around the outer circumference of the aforementioned internal unit, and multiple metal springs in the cylindrical space formed between the aforementioned external casing and the aforementioned metal cylinder that elastically support the aforementioned internal unit against the inside wall of the aforementioned external casing. The sectional shape of each of the aforementioned metal springs is such that the open end forms an arc part that curves inside, and the curvature between the arc part and the fixed end forms a bow-shaped part that is larger than the aforementioned arc part. The aforementioned multiple metal springs are arranged at equal intervals affixed to the outside surface of the aforementioned metal cylinder.

#### Application example

Next, this design will be explained by referring to Figures 1-3.

Figure 1 is a longitudinal cross section showing an application example of this design. Figure 2 is an oblique view showing the inside of the external casing. Figures 3 (a) and (b) are partial enlarged side views explaining the operation of the metal springs in Figure 1.

In Figure 1, thin metal cylinder (3) fits around the outer circumference of internal unit (1) that houses the undersea repeater. Arranging and affixing metal springs (4) at equal intervals on the surface of the outer circumference of metal cylinder (3) will produce a structure as shown in Figure 2. The sectional shape of each metal spring (4) is such that the open end forms arc part (4a) that is curved inside, and the curvature between arc part (4a) and fixed end (4c) forms bow-shaped part (4b) that is larger than arc part (4a) to give a so-called reel shape. Fixed ends (4c) are affixed to metal cylinder (3). It is inserted in this shape along the inside wall of external casing (2). When it is inserted, as shown in Figure 3 (a), the individual metal springs (4) are

inserted inside the cylindrical space formed between metal cylinder (3) and external casing (2) while portion (41) on the outside of each arc part (4a) touches the inside wall of external casing (2). Thus if the rigidity of metal springs (4) is made suitably low, there is little friction occurring on the inside wall of external casing (2) and insertion is accomplished easily.

Normally, internal unit (1) is supported in a balanced way against the inside wall of external casing (2) with metal cylinder (3) between them by portion (41) on the outside of multiple metal springs (4), as shown in Figure 3 (a). When external force, i.e., vibration or impact, is applied to internal unit (1), the external force is not very great. The external force is absorbed and buffered by the elasticity of the arc and bow-shaped parts of metal springs (4). When the external force becomes greater as the relative positions of internal unit (1) and external casing (2) changes, the metal springs flex and portion (42) facing portion (41) on the outside touches metal cylinder (3) to support internal unit (1), so the rigidity will be higher than in the case shown in Figure 3 (a). That is, internal unit (1) will not strike external casing (2) even with a larger vibration or impact.

Here, even when a vibration or impact is applied, metal springs (4) are touching external casing (2), so the ability to dissipate heat generated by the undersea repeater toward external casing (2) is as satisfactory as in normal instances.

### Effects of the design

This design, as explained above, has a structure where the open ends of the metal springs are in a reel shape, and the internal unit is supported in the external casing by multiple metal springs arranged and affixed at equal intervals around the outer circumference of a metal cylinder. Thus, insertion of the internal unit will be easy. The internal unit is normally supported with suitable elasticity, and when a large vibration or impact is applied, the rigidity of the metal springs increases to support the internal unit. So the effects are not only that movement of the internal unit can be suppressed and prevented from striking the external casing, but dissipation of heat generated by the internal unit is also improved.

### Brief description of the figures

Figure 1 is a longitudinal cross section showing an application example of this design. Figure 2 is an oblique view showing the inside of the external casing in Figure 1. Figures 3 (a) and (b) are partial enlarged side views explaining the operation of the metal springs in Figure 1. Figures 4 (a) and (b) are cross sections showing first and second examples of conventional structures.

(1) ... internal unit, (2) ... external casing, (3) ... metal cylinder, (4), (8), (9) ... metal spring, (4a) ... arc part, (4b) ... bow-shaped part, (4c) ... fixed end.

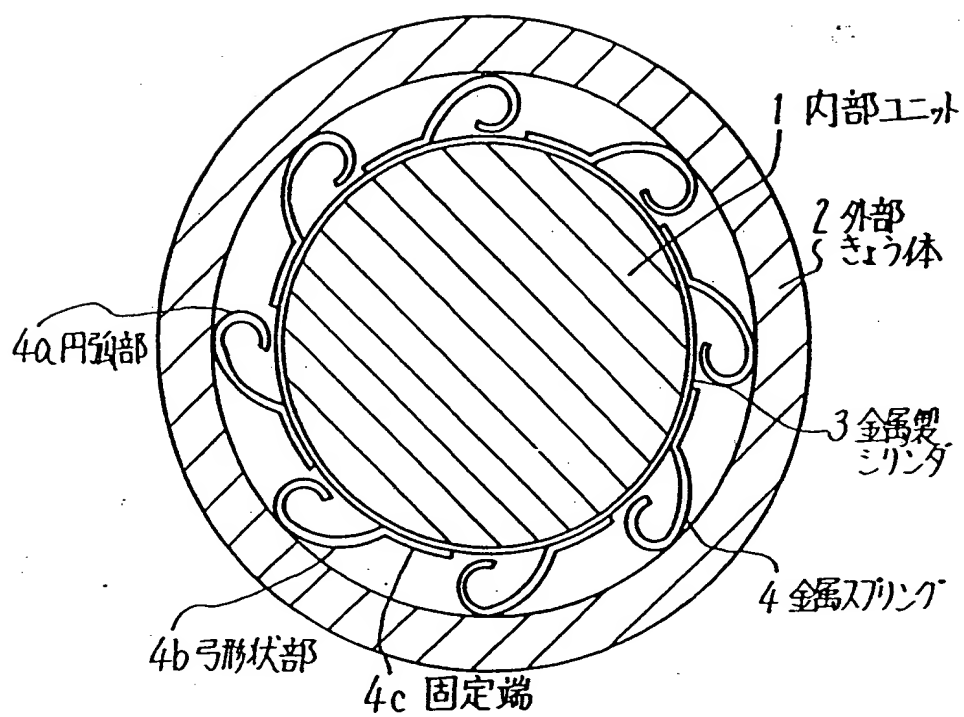


Figure 1

Key:	1	Internal unit
	2	External casing
	3	Metal cylinder
	4	Metal spring
	4a	Arc part
	4b	Bow-shaped part
	4c	Fixed end

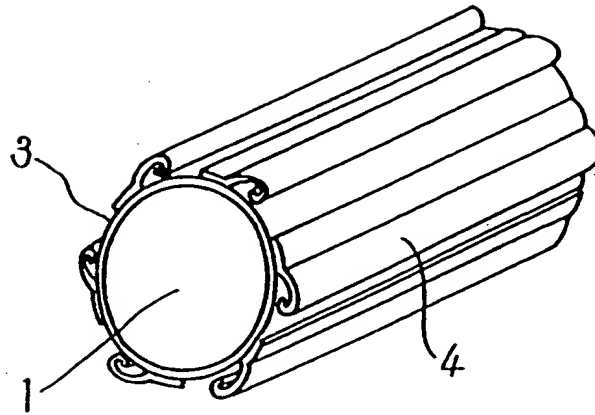


Figure 2

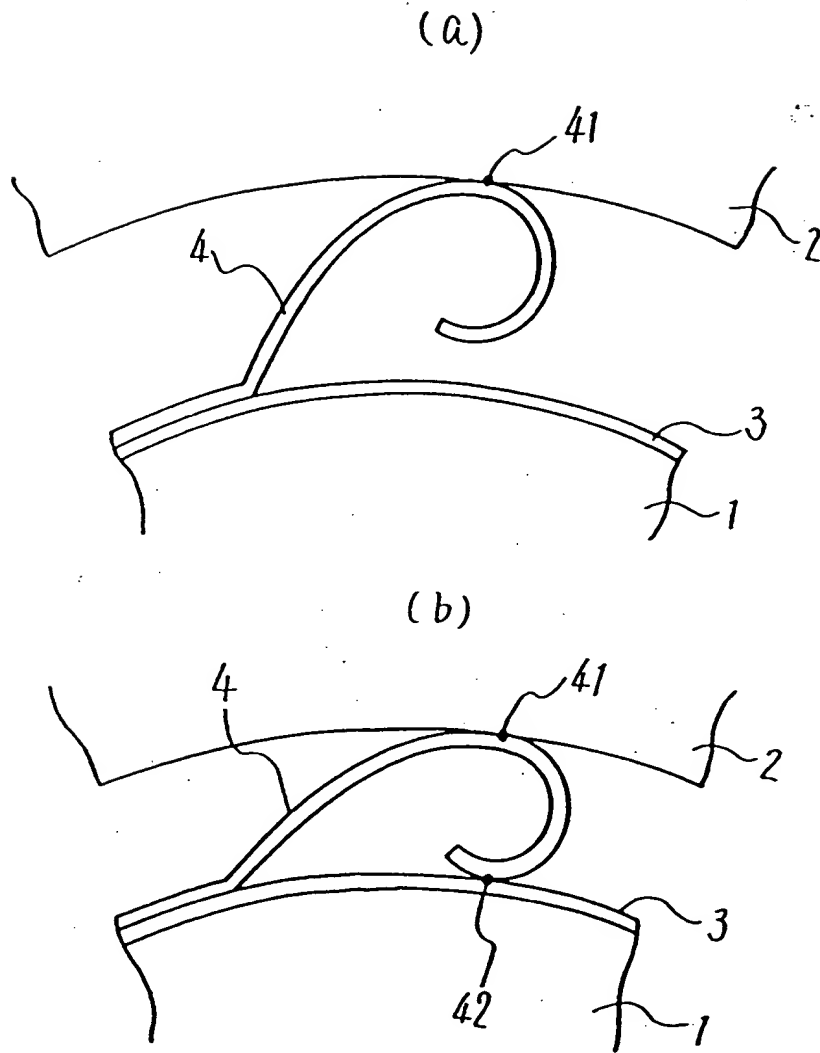
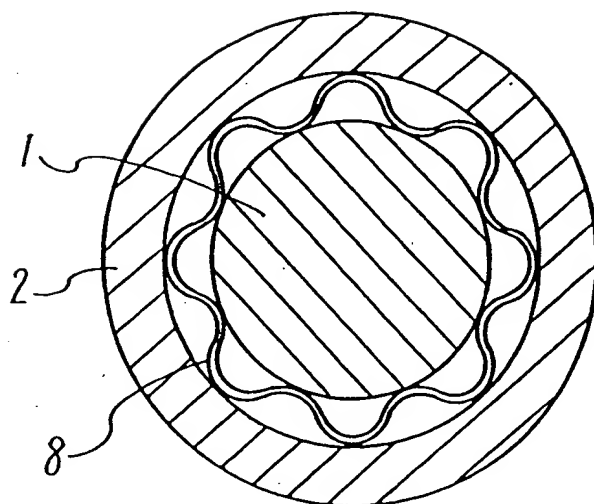


Figure 3

(a)



(b)

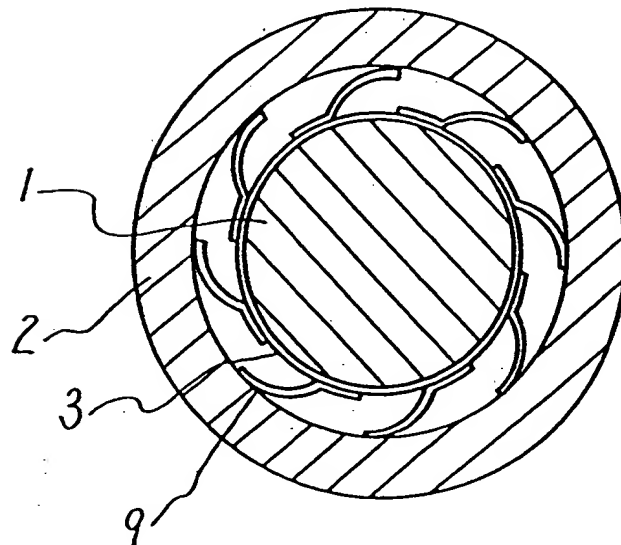


Figure 4